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Transitions Into Food Insecurity Associated With Behavioral Problems And Worse Overall Health Among Children

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ABSTRACT Children living in food-insecure households face myriad challenges to their well-being. The Great Recession of December 2007–June 2009 increased food insecurity to the highest levels ever measured in the United States. Using nationally representative data from the period 2010–12 for 6,300 children in the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11, with household incomes below 300 percent of the federal poverty level and a dynamic measure of food insecurity transitions, we assessed the impact of transitions into and out of household food insecurity on the academic achievement, behavioral problems, and health status of young children. We found negligible impacts of food insecurity transitions on academic achievement in first grade. However, we found consistent negative impacts of the transitions on teachers' reports of children's externalizing behaviors, self-control, and interpersonal skills and on parents' reports of children's overall health status. Taken together, our findings underline the importance of food security for children's healthy development.

The Great Recession from December 2007 to June 2009 was particularly hard on low-income families in the United States. Child poverty rates reached a high of 22 percent in 2010.[1] Enrollment in the Supplemental Nutrition Assistance Program (SNAP) more than doubled between 2000 and 2010, with nearly a third of the entire enrollment increase occurring between 2007 and 2009.[2]

Household food insecurity—defined as not having access at all times to enough food for a healthy, active lifestyle—reached epidemic levels during the height of the recession: It peaked at 21.3 percent in 2009, up from 15.6 percent in 2006, and was still at 19.5 percent in 2013 for households that included children.[3] Broadly speaking, more US children than ever before experienced food insecurity during the period 2008–11, and this increased exposure to hardship warrants new estimates of the impact of food insecurity on child well-being.

Health and well-being in early childhood, particularly around the time when children start elementary school, have long-term impacts on their healthy development. Thus, the Great Recession may have lingering effects on the health and development of cohorts of Americans in the coming decades. In this article we use newly available nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11, to assess how transitions into and out of food insecurity across kindergarten and first grade are associated with child well-being.

Food Insecurity And Child Well-Being

A number of studies have documented the link between food insecurity and academic achievement for children and adolescents. Worse perfor-

mance in math and reading,[4] loss of school days because of illness and repeated grades,[5,6] and lower engagement in school relative to food-secure children[7] have all been linked to living in food-insecure households.

In addition to academic and health deficiencies, food insecurity has been linked to behavioral problems in children. Food-insecure children have higher rates of externalizing behaviors, such as aggression; internalizing behaviors, such as depression and anxiety; and hyperactivity and inattention problems.[6,8–10]

The consequences of food insecurity on the health of children, from infants to school-age children, are clearly established.[5,11,12] In cross-sectional studies, children who were food insecure had lower levels of physical activity[13] and poorer diets relative to food-secure children.[14] They also had worse general health, more headaches, and more stomach aches.[15]

Researchers who used longitudinal data have shown that the number of episodes of hunger that children experience is related to their health as they grow older.[16] This indicates that the healthy development of children is associated not just with the presence but also with the severity and persistence of food insecurity.

Similar to poverty status, household food security status can be fluid. A change from having enough food to sustain a healthy lifestyle to having limited household food supplies may affect not just the physical but also the emotional and developmental well-being of children. Relative to research on the static state of food insecurity, research on changes in food security and the impact those changes have on children is much more limited. However, these studies reveal that health and development deficits for children with even temporary exposure to food insecurity may start small but have enduring impacts.[4,17,18]

Food insecurity is often a transient state. Thus, in this study we sought to quantify the impact of transitions into and out of food insecurity on child well-being across academic, behavioral, and health domains for young children in the United States after the Great Recession. If transitioning into food insecurity is a sign of family distress, we might expect to see more acute impacts of the transition on children shortly after it, relative to children who do not experience a transition, even if they are persistently food insecure. Similarly, if transitioning out of food insecurity is linked to an improvement in a family's economic status, children who make that transition may fare better than their peers who experience persistent insecurity or transition into food insecurity. If the state of being food insecure, no matter what its timing, is what influences child development, children who transition into food insecurity should have outcomes similar to those of children who are persistently food insecure.

We divided our outcomes of interest into two groups: those we expected would be affected most by persistent food insecurity (academic achievement and health status), and those we expected would be affected most by a transition into or out of food insecurity (four behavioral measures). We expected academic achievement and health status to be affected by a long-term constellation of factors, while children's behavior might be affected by factors that are more proximate in time.

Study Data And Methods

Data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11, provide one of the first nationally representative snapshots of child well-being after the Great Recession. When weighted, the data provide a nationally representative view of all US children who were in kindergarten in 2010–11. The study is ongoing. Restricted-access data were available for four waves: fall and spring for kindergarten and fall and spring for first grade.

The results of parent interviews, conducted by phone, are linked with direct assessments of children and with teachers' and school administrators' answers to questionnaires. Food insecurity data were collected in the spring wave of both kindergarten and first grade, which allowed us to assess changes in food insecurity and its link with child well-being.

Our starting sample ($N = 11{,}000$) consisted of all children with valid child assessments and parent interviews in the spring of kindergarten and first grade and a valid teacher response to a questionnaire in the spring of first grade (in accordance with our restricted data agreement, we rounded sample sizes to the nearest fifty). Children missing a parent interview at either spring wave were less likely to be white and had lower overall socioeconomic status, compared to children with parent interviews at both spring waves. However, the longitudinal weights provided by the study accounted for this potential bias. We limited the sample to the children for whom food insecurity was most relevant: those with household incomes below 300 percent of the federal poverty level in 2011. This gave us our final analytic sample of 6,300 children.

Our outcome measures spanned a range of child well-being outcomes, including academic, behavioral, and health outcomes. For the academic outcomes, we used item response theory–based achievement scores in reading, math, and science on tests administered in either English

and Spanish.[19] For the behavioral outcomes, we used teachers' rating of students on several items each for self-control, interpersonal skills, externalizing behaviors, and internalizing behaviors, based on the Social Skills Rating System.[20] Finally, for the health outcomes, we used parents' rating of their child's overall health status on a five-point scale ranging from excellent (5) to poor (1). Each measure was coded so that higher values reflected better outcomes.

Food insecurity was measured at both spring waves using an eighteen-item scale from the US Department of Agriculture.[21] Households responding positively to three or more of the items are classified as "food insecure." Importantly, children living in a food-insecure household may not experience food insecurity, because adults may attempt to shield children from an awareness of food insecurity or from the detrimental effects associated with food insecurity.[22]

To capture changes in food insecurity status, our dynamic measure compared families' status in the spring waves for kindergarten and first grade. Families were classified into four groups: food secure at both waves, became food secure (food insecure in kindergarten and food secure in first grade), became food insecure (food secure in kindergarten and food insecure in first grade), and food insecure at both waves.

Control measures were from the spring kindergarten wave, so they predated the outcome measures from the assessment in the spring of first grade. Child characteristics were the child's sex (1 = male), age (in months), and whether or not the child was low birthweight (1 = low birthweight). Family characteristics were whether one or both parents were foreign-born (1 = foreign-born parent); mother's age (in years); family structure (two biological parents, the reference group; single-mother family; or other family type); the score on a standardized family socioeconomic scale that included household income and parental employment status, occupational prestige, and education; and the number of siblings in the household. Each component of the family socioeconomic scale was imputed (if necessary) and standardized, and the final scale consisted of the average for all of the standardized components.[23]

We limited our sample to respondents with valid child and teacher assessments in the spring of first grade and valid parent assessments in the spring of kindergarten and first grade, yet some data were still missing. We used multiple imputation to replace missing values for covariates. Although we included dependent variables (the child outcome measures) in the imputation equation, we did not use the imputed dependent variables in our analyses.[24]

ANALYTIC STRATEGY First, we assessed the bivariate relationships between food insecurity status at both waves and the child well-being outcomes and covariates. We used *t*-tests for differences across categories and children who were food secure at both waves as our reference group. To assess the relationship between food insecurity transitions and child well-being outcomes, we used weighted ordinary least squares regression models with school fixed effects to predict all eight measures of child well-being. The school fixed effects accounted for unobserved but potentially important school characteristics, which might influence both the likelihood of food insecurity and the child well-being measures.

LIMITATIONS This study had several limitations. Although longitudinal, the study included data only on children in kindergarten and first grade. We assessed well-being across eight domains, but others are also important for child well-being. We accounted for a limited set of covariates, and some unobserved factors might have influenced our findings. Finally, we used a measure of household food insecurity instead of a more specific measure of food insecurity among children.

However, to our knowledge, the study is the first to provide a nationally representative view of the impact of food insecurity transitions on child well-being in the era after the Great Recession. When data from future waves of the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11, are released, we can assess the magnitude of the long-term impacts of food insecurity on this recent cohort of US children.

Study Results

There was significant movement across categories of food security between the two waves of the study (Exhibit 1). We found that 80 percent of children were food secure at both kindergarten and first grade, while 7 percent transitioned from being food insecure to being food secure, and 6 percent moved in the opposite direction. Seven percent of children in the sample were food insecure at both waves. In other words, 14 percent of children lived in food-insecure households in the kindergarten wave, compared to 13 percent of children in the first grade wave.

Our bivariate results demonstrate that children who were food insecure at one or both waves had significantly lower academic achievement scores in reading, math, and science, compared to children who were food secure at both waves, and that children who were food insecure at both waves scored lowest on all three measures (Exhibit 1). Teachers reported generally worse

EXHIBIT 1

Academic Outcomes, Health Outcomes, And Descriptive Characteristics Of 6,300 Children With Household Incomes Below 300 Percent Of The Federal Poverty Level In 2011, By Food Security Status

	Full sample	Food secure at both waves (80%)	Became food secure (7%)	Became food insecure (6%)	Food insecure at both waves (7%)
OUTCOMES IN SPRING OF FIRST GRADE					
Academic outcomes[a]					
Reading	70.55	71.42	68.16****	66.47****	66.03****
Math	63.81	64.63	61.58****	60.01****	59.59****
Science	27.05	27.47	25.61****	25.43****	24.81****
Behavioral outcomes[b]					
Self-control	3.23	3.26	3.12****	3.03****	3.13****
Interpersonal skills	3.16	3.19	3.08***	2.99****	3.06****
Externalizing behaviors	3.28	3.30	3.24	3.14****	3.19***
Internalizing behaviors	3.45	3.47	3.40**	3.40	3.33****
Health outcome					
Health status[c]	4.41	4.45	4.28****	4.23****	4.16****
COVARIATES IN SPRING OF KINDERGARTEN					
Male	50%	50%	52%	46%	55%
Age (months)	73.70	73.69	73.57	73.88	73.80
Low birthweight	9%	9%	9%	12%	11%
Foreign-born parent	27%	25%	40%****	33%***	40%****
Race/ethnicity					
Non-Hispanic white (ref)	53%	56%	38%****	44%***	38%****
Non-Hispanic black	12	12	15	11	15
Hispanic	26	23	38****	37****	38****
Asian	4	4	3**	3	2**
Other	5	5	6	5***	7***
Mother's age (years)	33.76	33.99	32.86***	32.36****	33.21**
Family structure					
Two biological parents (ref)	71%	74%	62%****	60%****	57%****
Single-mother family	21	19	28****	28***	33****
Other family type	8	8	10	12**	10
Family SES (standardized)[d]	–0.09	0.01	–0.51****	–0.44****	–0.64****
Number of siblings in the household	1.59	1.55	1.65	1.74**	1.86****

SOURCE Authors' analysis of data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11. **NOTES** The exhibit presents results from ordinary least squares regression models with school fixed effects. There were fall and spring waves for both kindergarten and first grade, but food insecurity data were collected only in the spring waves. Significance indicates difference from children who were food secure at both spring waves. [a]The highest possible scores were 100 for reading and math and 47 for science. [b]On a four-point scale that indicated the intensity of worrisome behaviors from low (4) to high (1). [c]On a five-point scale: 5 is excellent, 4 very good, 3 good, 2 fair, and 1 poor. [d]Socioeconomic status (SES) is a standardized scale that includes income and parental employment, occupational prestige, and education. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

scores for interpersonal skills, self-control, and internalizing and externalizing behaviors for all groups who experienced food insecurity. There were two exceptions: Internalizing behaviors among children who transitioned into food insecurity were not significantly different from those among children who were never food insecure, and externalizing behaviors among children who transitioned out of food insecurity were not significantly different from those of children who were food secure at both waves. Finally, parents in households that experienced food insecurity gave their children's overall health worse ratings than did parents in households that were food secure at both waves. Thus, before accounting for covariates, we found significant negative differences for all children who experienced food insecurity in at least one wave.

In terms of our covariates, compared to children who were food secure at both waves, children who experienced food insecurity were more likely to have a foreign-born parent, a younger mother, lower socioeconomic status, and more siblings in the household (Exhibit 1). They were also less likely to be non-Hispanic white, more likely to be Hispanic, and much less likely to live in a home with two biological parents.

Once we accounted for our covariates, we found no significant associations between food insecurity transitions and children's academic achievement outcomes (Exhibit 2). Although each model controlled for the full set of covariates and included school fixed effects, for parsimony we show only the associations between food insecurity transitions and child outcomes. Full regression results are presented in the on-

EXHIBIT 2

Associations Between Food Insecurity Transitions And Outcomes For 6,300 Children With Household Incomes Below 300 Percent Of The Federal Poverty Level In 2011

	Became food secure		Became food insecure		Food insecure at both waves	
Outcome	**ß**	**SE**	**ß**	**SE**	**ß**	**SE**
Reading	0.68	(0.68)	−1.41	(0.74)	−0.99	(0.70)
Math	0.57	(0.66)	−1.04	(0.75)	−1.12	(0.66)
Science	0.23	(0.33)	−0.25	(0.39)	−0.36	(0.32)
Interpersonal skills	−0.06	(0.04)	−0.17****	(0.05)	−0.05	(0.04)
Self-control	−0.06	(0.04)	−0.17****	(0.04)	−0.03	(0.04)
Externalizing behaviors	−0.01	(0.03)	−0.13***	(0.04)	−0.05	(0.04)
Internalizing behaviors	−0.06	(0.03)	−0.02	(0.04)	−0.12****	(0.03)
Health status	−0.08	(0.05)	−0.18****	(0.05)	−0.15***	(0.05)

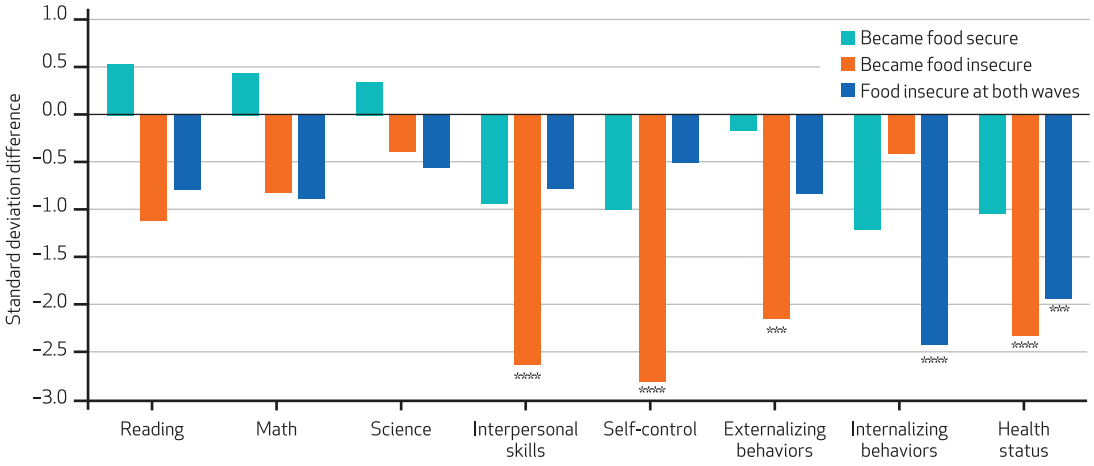
SOURCE Authors' analysis of data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11. **NOTES** The beta coefficients (ßs) indicate the differences in outcomes across food security categories. Significance indicates difference from children who were food secure at the spring waves in both kindergarten and first grade. All models controlled for child's sex, race/ethnicity, age, low birthweight, number of siblings, family structure, mother's age, parental nativity, and family socioeconomic status (explained in the text). ***$p < 0.01$ ****$p < 0.001$

line Appendix.[25] However, children who transitioned from food security to food insecurity showed significantly worse ratings on interpersonal skills, self-control, and externalizing behaviors, compared to children who were food secure at both waves. For example, children who became food insecure scored 0.17 points lower on interpersonal skills and self-control, which equates to approximately one-quarter of a standard deviation lower relative to children who were food secure at both waves. Similarly, children who became food insecure scored approximately one-fifth of a standard deviation lower in externalizing behaviors and health status relative to children who were food secure at both waves. For internalizing behaviors, there was a significant difference only for children who were food insecure at both waves—that is, persistently food insecure. Parents reported their child's health status as significantly worse if the child experienced a transition into food insecurity or was food insecure at both waves, than if the child remained food secure.

Exhibit 3 summarizes the results in Exhibit 2

EXHIBIT 3

Adjusted Standard Deviation Differences, Child Outcomes In First Grade And Food Insecurity Transitions, Among Children With Household Incomes Below 300 Percent Of The Federal Poverty Level In 2011



SOURCE Authors' analysis of 2011 data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11. **NOTES** Significance indicates difference from children who were food secure at both spring waves (kindergarten and first grade). All estimates were weighted, included school fixed effects, and adjusted for child's sex, race/ethnicity, age, low birthweight, number of siblings, family structure, mother's age, parental nativity, and family socioeconomic status (explained in the text). ***$p < 0.01$ ****$p < 0.001$

by transforming the coefficients for food insecurity transitions into standard deviations, using children who remained food secure as the reference group for children who transitioned into or out of food insecurity and those who remained food insecure, after all covariates were adjusted for. For example, the bars for self-control show a deficit of approximately three-tenths of a standard deviation for children who transitioned into food insecurity, compared to those who were food secure at both waves. And the bars for internalizing behaviors show no significant difference for children who transitioned into and out of food insecurity but do show a significant difference for children who were food insecure at both waves, compared to children who were food secure at both waves.

Discussion

Our study provides a broad, descriptive account of how food insecurity transitions affect young children in the short term, across three domains of well-being measures. Once child and family characteristics were taken into account, we found no evidence that food insecurity transitions affected first graders' academic outcomes. This suggests that the bivariate differences we observed were driven not by food insecurity but by family social and economic characteristics.

However, we did find consistent associations between transitions into food insecurity and child behavioral outcomes, including interpersonal skills, self-control, and externalizing behaviors. We also found deleterious associations between persistent food insecurity and internalizing behaviors. Parent-reported child health status was worse for both children who were persistently food insecure and those who transitioned into food insecurity

Our findings provide evidence for our hypotheses that longer-term outcomes, such as academic achievement and health status, would be less affected by food insecurity transitions, compared to behavioral outcomes; and that, conversely, behavioral outcomes would be more sensitive than other outcomes to those transitions. The exception was for internalizing behaviors, which showed no significant association with transitions but were associated with persistent food insecurity. Internalizing behaviors in children, such as anxiety and depressive symptoms, may be less sensitive to shorter-term changes in family circumstances, compared to other behavioral outcomes, such as externalizing behaviors.

Our overall findings raise concerns about the present state of child well-being and also for the long-term vitality of the United States. Children's behavioral outcomes and health status early in life are associated with reductions in workforce productivity and earnings, as well as with greater health problems over the life course and shortened life overall.[26,27]

We estimated that in 2010–11, 14 percent of US kindergarten children in families whose incomes were less than 300 percent of poverty lived in food-insecure households. This is low compared to the national estimate of 21 percent for all households with children in 2010—2011.[28] In our full sample, which included families with incomes above 300 percent of poverty, we found that 11 percent of children lived in food-insecure households. However, our data consisted of a representative sample of US households with a kindergartener in 2010–11, instead of all US households with one or more children under age eighteen.

Nonetheless, these estimates, combined with our research and that of other scholars[5] that connected food insecurity to negative outcomes for children, indicate a worrisome future. Children are showing the impacts of food insecurity on behavioral and health outcomes in first grade, and those effects may linger through the life course.

Our dynamic approach to understanding food insecurity provides unique insights into behavioral problems.[6,9,10] Whereas previous research[8] has found broad associations between food insecurity and behavioral problems, our results suggest that the timing and duration of food insecurity are key. Children transitioning into food insecurity display more externalizing behavioral problems, while children in chronic states of food insecurity display more internalizing behavioral problems. These findings reveal that the transition into food insecurity may be a stressful and frightening experience that can change the way children engage with the world. At the same time, persistent food insecurity may contribute to poor self-esteem and other serious and long-term problems, such as depression and substance abuse. These findings suggest that static approaches to studying food insecurity may miss important details in understanding child well-being.

Conclusion

Our findings demonstrate the multifaceted impacts of food insecurity on child well-being. Although we found no significant associations between food insecurity and academic outcomes, we did find consistent increased behavioral problems and worse reported overall health status—results that are troubling. More dynamic approaches to studying food insecurity are needed, which demonstrates the vital importance of

longitudinal and comprehensive data. Furthermore, food insecurity is not just another issue that poor families face. Instead, it is a fundamental and multidimensional obstacle to the healthy development of children. ■

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NOTES

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